CLAIMS

What is claimed is:

1. A method of performing an assay in a mass spectrometry system comprising:

a. inputting a plurality of case samples and control samples;

b. identifying a pattern of polypeptides associated with said case samples and said control samples;

c. among said polypeptides identified in said case samples and said control samples, identifying patterns of at least selected polypeptides that are present in said cases and said controls; and

d. performing an assay on a selected sample by

i. removing at least some of said selected polypeptides from said case samples and said control samples; and

ii. among remaining polypeptides, associating said selected sample as associated with said cases or said controls.

2. The method as recited in claim 1 wherein said assay on said selected sample comprises detecting said sample in a time of flight mass spectrometer.

3. The method as recited in claim 1 wherein said assay on said selected sample further comprises separation of the remaining polypeptides.

4. The method as recited in claim 1 wherein said assay further comprises the step of performing a microfluidic separation on said selected sample.

5. The method as recited in claim 1 wherein assay is performed to analyze at least 15 polypeptide markers.

6. The method as recited in claim 1 further comprising the step of performing analysis on additional selected samples, and wherein said step of removing said selected polypeptides from said additional selected samples is performed on a disposable microfluidics device.

7. The method as recited in claim 1 wherein said case samples and said control samples are used to separate a disease state selected from the group consisting of a cancer disease state, a cardiovascular disease state, an infectious disease state, and a pregnancy-related disorder.

8. The method as recited in claim 1 wherein said removing step is performed in a microfluidics device.

9. The method as recited in claim 8 wherein said microfluidics device is a disposable device.

10. The method as recited in claim 1 wherein said removal step is performed in a solid phase extraction resin.

11. The method as recited in claim 1 wherein said removal step is performed in a reversed phase chromatography resin.

12. A method of performing analysis in a mass spectrometry system comprising:

a. performing sample preparation on a first sample in said mass spectrometry system;

b. inputting said first sample to a mass spectrometer; and

c. analyzing data from said mass spectrometry system in a data analysis system while a second sample is processed in said mass spectrometry system, wherein said mass spectrometry system is used to separate case samples from control samples in a diagnostic assay.

13. The method as recited in claim 12 wherein said assay on said mass spectrometer is a time of flight mass spectrometer.

14. The method as recited in claim 12 wherein analysis is performed to analyze at least 15 polypeptide markers.

15. The method as recited in claim 12 wherein said sample preparation is performed in a disposable microfluidics device.

16. The method as recited in claim 12 wherein said data from a mass spectrometry system are used to separate a disease state selected from the group consisting of a cancer disease state, a cardiovascular disease state, an infectious disease state, and pregnancy related disorders.

17. A system for analyzing biological samples comprising:

a. a microfluidics device comprising a separation section and an electrospray section coupled to said separation section, said microfluidics device being a disposable device; and

b. a mass spectrometer coupled to said microfluidics device.

18. The system as recited in claim 17 wherein said mass spectrometer is a time of flight mass spectrometer.

19. The system as recited in claim 17 wherein said system analyzes at least 15 polypeptide markers.

20. The system as recited in claim 17 wherein said microfluidics device is a disposable device removably coupled to said mass spectrometer.

21. The system as recited in claim 17 wherein said system is used to separate a disease state selected from the group consisting of a cancer disease state, a cardiovascular disease state, an infectious disease state, and pregnancy related disorders.

22. The system as recited in claim 17 wherein said microfluidics device comprises a capillary electrophoresis device.

23. The system as recited in claim 17 wherein said microfluidics device comprises a solid phase extraction resin.

24. The system as recited in claim 17 wherein said microfluidics device comprises reverse phase chromatography device.

25. A system for analyzing biological samples comprising:

a. a sample preparation device comprising a separation section, a sample ionizer, and an ion excitation section;

b. a mass spectrometer coupled to said sample preparation device; and

c. a switch coupled to said ion excitation element.

26. The system as recited in claim 25 wherein said mass spectrometer is a time of flight mass spectrometer.

27. The system as recited in claim 25 wherein said system analyzes at least 15 polypeptide markers.

28. The system as recited in claim 25 wherein said sample preparation device is a disposable microfluidics device.

29. The system as recited in claim 25 wherein data from said mass spectrometry system are used to separate a disease state selected from the group consisting of a cancer disease state, a cardiovascular disease state, an infectious disease state, and pregnancy related disorders.

30. The system as recited in claim 25 wherein said switch controllably excites samples to detect selected protein fragments.

31. A system for analyzing biological samples comprising:

a. a sample preparation device, said sample preparation device comprising a polypeptide denaturation system and a polypeptide removal system;

b. a sample analysis device comprising a mass spectrometer, said sample analysis device identifying at least some biological markers of interest in said biological samples that were bound to the polypeptides that were removed in said polypeptide removal system.

32. The system as recited in claim 31 wherein said sample analysis device comprises a mass spectrometer.

33. The system as recited in claim 31 wherein said system analyzes at least 15 polypeptide markers.

34. The system as recited in claim 31 wherein said sample preparation device comprises a disposable microfluidics device.

35. The system as recited in claim 31 wherein data from said mass spectrometer are used to separate a disease state selected from the group consisting of a cancer disease state, a cardiovascular disease state, an infectious disease state, and pregnancy related disorders.

36. The system as recited in claim 31 wherein said denaturation system and said removal system are in a microfluidics device.

37. The system as recited in claim 31 wherein said microfluidics device is a disposable device.

38. The method as recited in claim 31 wherein said polypeptide denaturation system is an acidification system.

39. A system for analyzing biological samples comprising:

a. a sample processing system comprising:

i. a sample preparation device; and

ii. a mass spectrometer coupled to said sample preparation device; and

b. an analysis system coupled to said sample processing system, said analysis system detecting at least one common calibrant; comparing a time of detection to of said marker to a known time; and adjusting a speed of operation of said sample processing system in response to said comparing step.

40. The system as recited in claim 39 wherein spectrometer is a time of flight mass spectrometer.

41. The system as recited in claim 39 wherein said system analyzes at least 15 polypeptide markers.

42. The system as recited in claim 39 wherein said sample preparation device is a disposable microfluidics device.

43. The system as recited in claim 39 wherein data from said mass spectrometer are used to separate a disease state selected from the group consisting of a cancer disease state, a cardiovascular disease state, an infectious disease state, and pregnancy related disorders.

44. The method as recited in claim 39 wherein said speed is adjusted to provide less precision in non-informative spectral regions.

45. The method as recited in claim 39 wherein said speed is adjusted to provide greater precision in informative spectral regions.

46. A system for analyzing biological samples comprising:

a. a sample processing system comprising:

i. a sample preparation device; and

ii. a mass spectrometer coupled to said sample preparation device; and

b. an analysis system coupled to said sample processing system, said analysis system adjusting a speed of operation of said sample processing system at a time when a selected marker is expected to be detected.

47. The system as recited in claim 46 wherein said adjusting is a speeding adjustment for a component of less interest.

48. The system as recited in claim 46 wherein said adjusting is a slowing adjustment for a marker of greater interest.

49. The system as recited in claims 48 wherein said system is slowed at an expected time of detection of a marker of interest.

50. The system as recited in claim 46 wherein said system compares a time of detection for a calibrant marker.

51. The method as recited in claim 46 wherein said speed of operation is adjusted through a selected one of a temperature, a pressure, a voltage, or a current.

52. The system as recited in claim 46 wherein said mass spectrometer is a time of flight mass spectrometer.

53. The system as recited in claim 46 wherein said system analyzes at least 15 polypeptide markers.

54. The system as recited in claim 46 wherein said sample preparation device comprises a disposable microfluidics device.

55. The system as recited in claim 46 wherein data from said mass spectrometer are used to separate a disease state selected from the group consisting of a cancer disease state, a cardiovascular disease state, an infectious disease state, and pregnancy related disorders.

56. A system for analyzing biological samples comprising:

a. an integrated sample preparation system and electrospray device; and

b. a mass spectrometer adapted to receive samples from said electrospray device wherein said sample preparation and electrospray device is a disposable device to be coupled to said mass spectrometer.

57. The system as recited in claim 56 wherein said integrated sample preparation and electrospray device comprise a solid phase extraction resin.

58. The system as recited in claim 56 wherein said integrated sample preparation and electrospray device comprises a reversed phase chromatography device.

59. The system as recited in claim 56 wherein said mass spectrometer is a time of flight mass spectrometer.

60. The system as recited in claim 56 wherein said system analyzes at least 15 polypeptide markers.

61. The system as recited in claim 56 wherein said integrated sample preparation and electrospray device is a disposable microfluidics device.

62. The system as recited in claim 56 wherein data from said mass spectrometer are used to separate a disease state selected from the group consisting of a cancer disease state, a cardiovascular disease state, an infectious disease state, and pregnancy related disorders.

63. A method of performing analysis in a mass spectrometry system comprising:

a. inputting a plurality of case and control samples;

b. identifying a pattern of polypeptide markers associated with said cases and said controls;

c. among said markers identified in said cases and said controls, identifying at least 15 selected polypeptide markers that distinguish said cases or said controls in a mass spectrometry system; and

d. performing an assay on a selected sample in a mass spectrometer by evaluating said at least 15 markers, and characterizing said selected sample based on said assay.

64. The method as recited in claim 63 wherein said patterns are identified in a mass spectrometer.

65. The method as recited in claim 63 wherein said mass spectrometer is a time of flight mass spectrometer.

66. The method as recited in claim 63 wherein said step of identifying is performed using a mass spectrometer and a disposable microfluidics device.

67. The method as recited in claim 63 wherein at least 50 polypeptide markers are used to distinguish said cases and said controls.

68. The method as recited in claim 63 wherein at least 100 polypeptide markers are used to distinguish said cases and said controls.

69. The method as recited in claim 63 wherein at least 1000 polypeptide markers are used to distinguish said cases and said controls.

70. The system as recited in claim 63 wherein data from said mass spectrometer are used to separate a disease state selected from the group consisting of a cancer disease state, a cardiovascular disease state, an infectious disease state, and pregnancy related disorders.

71. The system as recited in claim 64 wherein an identity of at least some of said markers is not known.

72. A method of analyzing biological samples comprising:

a. inputting a sample to a microfluidics electrophoretic and sample preparation device and applying pressure to said sample after at least partially preparing said sample in said sample preparation device;

b. passing said sample to a mass spectrometer; and

c. analyzing said sample.

73. The method as recited in claim 72 wherein said microfluidics device is a disposable device.

74. The method as recited in claim 72 wherein said samples comprise case samples and control samples and said method identifies more than 15 protein markers separating said case and control samples.

75. The method as recited in claim 72 wherein said mass spectrometer is a time of flight mass spectrometer.